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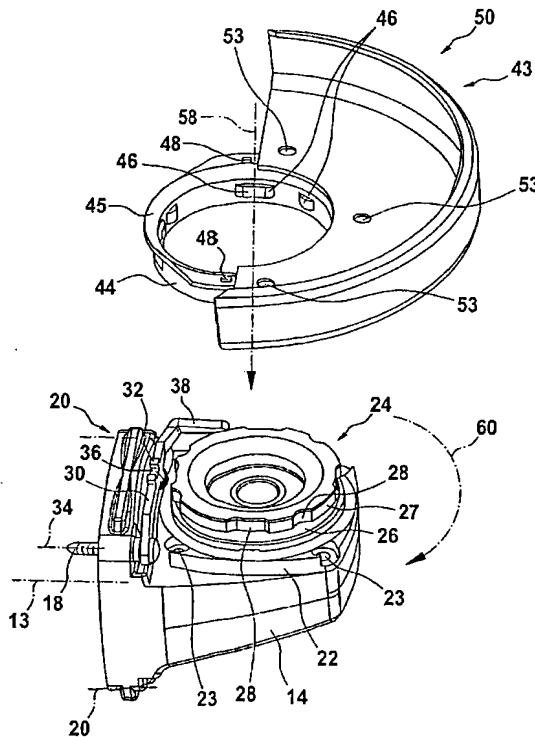
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[Fortsetzung auf der nächsten Seite]

(54) Title: PORTABLE POWER TOOL WITH PROTECTIVE COVER

(54) Bezeichnung: HANDWERKZEUGMASCHINE MIT SCHUTZHAUBE



(57) Abstract: The invention relates to a portable power tool, especially an angle grinder (10), comprising an elongate housing (12) which receives a motor for driving a driven shaft (16) that is bent relative to the housing (12). Said shaft is rotatably mounted in a transmission housing (14) and projects therefrom with one free end provided for receiving an abrasive body. A protective cover (43) enclosing the abrasive body is fastened on the transmission housing (14) so as to be adjusted by rotation, the rotational position thereof being lockable by means of a detent lever (30). The aim of the invention is to provide a portable power tool of the aforementioned type that can be manufactured in a functionally reliable and cost-effective manner. For this purpose, the detent lever (30) is mounted perpendicularly to the longitudinal axis of the angle grinder (10) and can be swiveled about an axis (34) that is substantially parallel to the housing (12).

(57) Zusammenfassung: Eine Handwerkzeugmaschine, insbesondere Winkelschleifer (10), mit einem länglichen Gehäuse (12) zur Aufnahme eines Motors zum Antrieb einer zum Gehäuse (12) abgewinkelten Abtriebswelle (16), die in einem Getriebegehäuse (14) drehbar gelagert ist und aus diesem mit einem freien Ende heraustritt, das zur Aufnahme eines Schleifkörpers vorgesehen ist, wobei eine den Schleifkörper umgreifende Schutzhaube (43) am Getriebegehäuse (14) drehbar befestigbar und deren Drehposition mittels eines Rasthebels (30) arretierbar ist, wird dadurch funktionssicherer und kostengünstiger herstellbar, dass der Rasthebel (30) quer zur Längsachse des Winkelschleifers (10) angeordnet und um eine i.w. parallel zum Gehäuse (12) angeordnete Achse (34) schwenkbar ist.

WO 2005/035190 A1

## 1 PORTABLE POWER TOOL WITH PROTECTIVE COVER

2  
3 Background Information

4  
5 The present invention is based on a portable power tool according to the  
6 definition of the species of Claim 1.

7  
8 A portable power tool is already known from DE 199 14 855 A1, which is  
9 designed as an angle grinder and is provided with a protective cover, the  
10 rotational position of which is fixable in the circumferential direction using a  
11 simple, releasable locking mechanism. Its catch mechanism is composed  
12 essentially of a flat spring, the projections of which are capable of being  
13 disengaged from recesses in the protective cover to allow the protective cover to  
14 be adjusted by hand, and the retention forces of which are impaired by  
15 deformation of the catch mechanism caused by intensive worksite use.

16  
17 Advantages of the Invention

18  
19 The present invention with the features of Claim 1 has the advantage that a  
20 protective cover with an associated robust, simple method for locking the  
21 protective cover in place is capable of being installed on conventional portable  
22 power tools, on angle grinders in particular, without making any structural  
23 changes, the locking method enabling the protective cover to be reliably fixed in  
24 any rotational position.

25  
26 Due to the fact that the notch lever is positioned transversely to the longitudinal  
27 axis of the angle grinder and is pivotable around an axis situated substantially  
28 parallel to the housing, the tracks of motion of the notch lever are fixed; as a  
29 result, changes in the locking characteristics of the protective cover are  
30 prevented.

31

1 Due to the fact that the notch lever touches the protective cover in a detent  
2 position, the protective cover is fixable in this position in a form-locked or non-  
3 positive manner.

4  
5 Due to the fact that the notch lever is elastically preloaded in the direction toward  
6 the protective cover, constant contact between the notch lever and the protective  
7 cover is ensured.

8  
9 Due to the fact that the notch lever includes a pusher button on one free end  
10 and/or at least one centrally positioned engagement cam on the other end—the  
11 engagement cam engaging in the protective cover and holding it in place in a  
12 form-locked manner—an easy-to-operate, robust and exact detent means is  
13 created.

14  
15 Due to the fact that the notch lever is pivotably supported on the housing, in  
16 particular on the gearbox casing, a flange screw must be loosened and screwed  
17 back into place to operate and install the notch lever.

18  
19 Due to the fact that the pusher button of the notch lever extends transversely to  
20 the gearbox casing and past its circumference, it is easily accessible by at least  
21 one finger, in particular by the index finger of the operator's hand encompassing  
22 the housing in the working position, the protective cover can be adjusted  
23 conveniently and quickly, and operating error is prevented.

24  
25 Due to the fact that the protective cover is capable of being engaged with the  
26 rigid engagement cam in a form-locked manner, the protective cover can be  
27 positioned in any rotational position largely without play such that it is secured  
28 against coming loose unintentionally.

29  
30 Due to the fact that the gearbox casing has a flange that is capable of being  
31 screwed to the housing, whereby one of the flange screws also functions as

1 rotational axis of the notch lever, the locking means of the angle grinder  
2 protective cover is easy to install on conventional angle grinders.

3  
4 Due to the fact that the protective cover has engagement openings arranged in a  
5 semicircle for engagement by the engagement cams of the notch lever, the  
6 protective cover can be locked securely and in a form-locked manner in  
7 predetermined rotational positions relative to the portable power tool.

8  
9 Due to the fact that the protective cover has a multiple-component design,  
10 whereby the first part is an annular collar, in particular having a U-bent edge  
11 region, made of a strong material, and a second part is a disk-shaped main body,  
12 it is possible to manufacture the protective cover out of different materials in a  
13 particularly cost-effective manner, because the parts can be processed more  
14 favorably separately from each other, and the protective cover is capable of  
15 being manufactured as a lightweight component.

16  
17 Due to the fact that the annular collar part includes a U-bent region designed in  
18 the manner of a hat brim, which includes the engagement openings, the second  
19 part, i.e., the main body of the protective cover, can be made of particularly thin  
20 material, because the collar part alone absorbs the retention forces between the  
21 engagement openings and the engagement cams on the notch lever.

22  
23 Due to the fact that an annular flat spring is provided in the fastening region of  
24 the angle grinder protective cover on the neck of the gearbox casing, the annular  
25 flat spring retaining the protective cover on the gearbox casing axially, without  
26 play, in a radially rotatable manner, the fastening region of the gearbox casing  
27 that supports the protective cover can be composed of relatively roughly  
28 tolerated plastic, because the annular flat spring compensates for dimensional  
29 deviations and/or wear in the fastening region.

30

Due to the fact that the gearbox casing includes a fastening region for the protective cover configured as a cylindrical plastic neck, the fastening region belonging to a bearing flange that concentrically encompasses the driven shaft, the weight of the gearbox casing can be reduced and, therefore, so can the weight of the entire portable power tool, so the portable power tool is easier to handle and can be operated without tiring the operator.

#### Drawing

The present invention is described in greater detail below with reference to an exemplary embodiment with associated drawing.

Figure 1 shows the portable power tool with protective cover in an exploded view,

Figure 2 shows the portable power tool according to Figure 1 with assembled protective cover before installation,

Figure 3 shows the individual parts of a dual-component exemplary embodiment of the protective cover,

Figure 4 shows the protective cover according to Figure 3, assembled,

Figure 5 shows a second exemplary embodiment of a dual-component protective cover, in an exploded view,

Figure 6 shows the exemplary embodiment according to Figure 5, assembled,

Figure 7 shows a dual-component protective cover with plastic collar and metallic main body, and

Figure 8 shows a single-component protective cover according to the present invention, composed of metal.

## Detailed Description of the Embodiments

Figure 1 shows the front region of a portable power tool 10 designed as an angle grinder, longitudinal housing 12 of which determines a longitudinal axis 13 of portable power tool 10. A gearbox casing 14 is flange-mounted to housing 12, out of which a driven shaft 16 exits at a right angle to longitudinal axis 13. A sanding disk (not shown) is capable of being fastened to its free end, the sanding disk being encompassed by a protective cover 43 to protect the operator of portable power tool 10 from flying chips and/or parts of the sanding disk.

Gearbox casing 14 is fastened to housing 12 with flange screws 18 that engage in flange holes 20 extending parallel with longitudinal axis 13. Gearbox casing 14 includes a bearing flange 22 that encompasses driven shaft 16 in an annular manner. Bearing flange 22 is configured in the shape of a plate in the region facing gearbox casing 14 and is connectable with gearbox casing 14 via a flange screwed connection 23 positioned substantially parallel to driven shaft 16.

Bearing flange 22 includes a cylindrical neck 24 projecting upwardly outward at a right angle to longitudinal axis 13 and accommodating protective cover 43 on its outer circumference and including an annular groove 26 in an axial position nearly in the center, whereby its outer, ridge-like annular groove delineation 27 is interrupted at regular intervals by axial grooves 28 that are assigned to corresponding radial cams 46 in collar 44 of protective cover 43 and which are to be coupled, matching up with each other, using an insertion-rotation motion, in the manner of a key in a lock or a quarter-turn fastener system.

Protective cover 43 is composed of a disk-like, half-moon-shaped main body 53 with a central hole 55, the outer edge 54 of which is U-bent and, as a result, extends in the manner of a partial cylindrical jacket. Main body 50 encompasses, nearly halfway, the circumference of a circular-disk-shaped sanding body (not shown) that is driven in a rotary manner by driven shaft 16, as is commonplace

1 with angular grinders. Main body 50 is connected with a circular-ring-shaped  
2 collar 44 that includes a region 45 U-bent outwardly laterally in the manner of a  
3 hat brim. It extends in parallel with perforated disk 52 of main body 50 and  
4 concentrically to central hole 55 of perforated disk 52.

5  
6 Collar 44 is connectable with main body 50 by adhesion, welding, soldering or  
7 the like. It includes impressed, radially inwardly extending radial cams 46. Their  
8 dimensions match those of axial grooves 28 in neck 24 of bearing flange 22 such  
9 that they pass through them when inserted axially, then enter annular groove 26  
10 when rotated radially, where they hold protective cover 43 tightly in an axially  
11 secured manner. In its region that is U-bent in the manner of a hat brim, collar 44  
12 includes engagement openings 48 into which engagement cams 32 of a notch  
13 lever 30 fit and enter and thereby secure protective cover 43 against twisting on  
14 gearbox casing 14.

15  
16 The particular different widths and identical height of radial cams 46 are matched  
17 in terms of dimensions with the corresponding annular grooves 26 having  
18 uniform width, and axial grooves 28 having different widths, on neck 24. Only  
19 protective covers 43 that fit particular neck 24 grooved in a coded manner can be  
20 guided axially via the collar over neck 24 and fastened thereto in an operationally  
21 correct manner. To this end, the manufacturer must first slide a snap-ring-like  
22 annular spring 40 slotted in a particular manner axially over neck 24, whereby its  
23 spring cam 42 must be guided through one of the axial grooves 28 and then,  
24 perhaps after being twisted radially, staked in annular groove 26 or fixed in place  
25 by bending it upward or downward in a pocket 41 on lower edge of neck 24,  
26 thereby securing it against coming loose.

27  
28 The operator then guides protective cover 43 with radial cams 46 over axial  
29 grooves 28 of neck 24 until radial cams 46 contact the lower edge of annular  
30 groove 26, and protective cover 43 can then only be twisted, whereby radial  
31 cams 46 enter annular groove 26 laterally in the manner of a quarter-turn

1 fastener and are held securely therein and prevented from coming out axially,  
2 whereby they are retained in an axially preloaded and, therefore, play-free  
3 manner by annular spring 40.

4  
5 On its side furthest from the housing, notch lever 30 includes, on the top, a  
6 region with engagement cams 32 designed to engage in engagement openings  
7 48. Notch lever 30 also includes, on its free end, a hole extending toward  
8 engagement cams 32 offset by nearly 90, through which a flange screw 18 is  
9 guidable for screwing into a certain flange hole 20, and which functions as pivot  
10 axis 34 of the notch lever. Notch lever 30 includes, nearly in the center, a  
11 transversely projecting, captively securable compression spring 36 with which  
12 notch lever 30 bears against gearbox casing 14 in a preloaded manner such that  
13 it can always bear against U-bend 45 of collar 44 with a minimum force with its  
14 cams 32, thereby securing the engagement cams 32 in engagement openings  
15 48.

16  
17 Main body 50 of protective cover 43 includes welding holes 53, through which  
18 main body 50 can be welded and/or soldered with collar 44 and/or with U-bend  
19 45.

20  
21 Figure 2 shows—as does Figure 1—the spacial view of portable power tool 10  
22 with protective cover 43, whereby protective cover 43 is assembled and attached  
23 to welding holes 53 by welding and forms a unit with collar 44.

24  
25 Only gearbox casing 14 of portable power tool 10 is shown in Figure 2, whereby  
26 the individual parts shown separately in an exploded view in Figure 1 are located  
27 in the final assembled position, clearly illustrating the arrangement of notch lever  
28 30. Going beyond Figure 1, Figure 2 shows an axial arrow 58, according to which  
29 protective cover 43 is slid over neck 24 and then twisted in accordance with a  
30 curved arrow 60 such that the round edge of main body 50 is turned relative to  
31 the position shown. As a result, operating personnel situated behind the tool



engagement site in the extension of longitudinal axis 13 are protected against dust, chips, splinters or the like.

To turn protective cover 43 out of its selected detent position, an end region of notch lever 30 configured as a pusher button 38 must be swiveled away from protective cover 43 and toward gearbox casing 14, so that the two engagement cams 32 come out of the two diametrically opposed engagement openings 48 and no longer prevent protective cover 43 from turning. Notch lever 30 is released only when in the desired rotational position, so it can engage with its engagement cams 32 in engagement openings 48—preloaded by compression spring 36—and secure protective cover 43 against unintentional motion.

Figure 3 shows a further exemplary embodiment of a protective cover 430 that differs from protective cover 43 in Figures 1 and 2 in that collar 440 is composed of plastic or metal that can engage via a radially outwardly extending snap-in hook 64 in corresponding snap-in openings 65 of main body 500 by inserting it through central hole 51 and fixing it in place via overlatching, so that its U-bent, hat-brim-like region 66 comes to rest on main body 500.

In this case, engagement openings 48 are located in main body 500, which must be designed thicker in this case to be able to absorb the engagement forces and/or retention forces for securing protective cover 24 on gearbox casing 14 by notch lever 30.

Figure 4 shows protective cover 430 in the installed state, whereby it is clear that snap-in hooks 64 project radially outwardly and grip over main body 500 and secure its position relative to collar 440. Figure 5 shows a further exemplary embodiment of a removed protective cover 432, collar 441 of which is welded with main body 501, thereby corresponding substantially to protective cover 43 according to Figure 2.

Figure 6 shows protective cover 432, whereby, unlike the previous figures, it shows that welding holes 53 are welded with collar 44.

Figure 7 shows a protective cover 434, the collar ring 48 of which is composed of plastic which is applied by injection molding to main body 504 in the region of its central hole 51.

Figure 8 shows a single-component protective cover 433 made of steel, in the case of which, as also shown in Figure 7, engagement openings 48 are located in main body 502 (504), whereby the advantage of this protective cover is that it is capable of being manufactured in a single working step, even though more material is required in this case than with the other versions.